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THE NAME OF THE EAST AFRICAN VERVET MONKEY (GENUS *CHLOROCEBUS* GRAY, 1870)

(MAMMALIA, PRIMATES, CERCOPITHECIDAE)

Guenons of the genus *Chlorocebus* Gray, 1870 represent a well-known challenge for taxonomists. For many decades, after SCHWARZ (1926), only one species - *Cercopithecus aethiops* (Linnaeus, 1758) - was considered valid, with a number of subspecies. In 1959 Dandelot proposed to consider *aethiops* as a superspecies with three species (DANDELOT 1959) and later research demonstrated the existence of further narrow-distributed endemic species in Ethiopia (DANDELOT & PREVOST 1972; CARPANETO & GIPPOLITI 1994). For a synthesis of taxonomic history, see GRUBB *et al.* (2003).

Cercopithecus hilgerti was described from the German zoologist Oscar Neumann in 1902. The type locality is the Gobele River near the Webi Shebeli, eastern Abyssinia (Ethiopia). The name *hilgerti* was considered a synonym (or a subspecies) of *aethiops* sensu stricto by POCOCK (1907), HILL (1966), DANDELOT & PREVOST (1972), NAPIER (1981) and LERNOULD (1988). GROVES (2001) finally moved the *aethiops* complex into genus *Chlorocebus* and a six-species taxonomy was proposed: *C. sabaeus* (Linnaeus, 1766) in West Africa, *C. tantalus* (Ogilby, 1842) in northern savanna belt E to the Nile, *C. aethiops* in NE Africa, Eritrea, northern Ethiopia, *C. djamdjamensis* (Neumann, 1902) in Bale Mts, *C. pygerythrus* (F. Cuvier, 1821) in

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Eastern Africa from southern Ethiopia to South Africa, *C. cynosuros* (Scopoli, 1786) in Zambia and Angola.

Groves (2001: 202) accepted *hilgerti* as a valid subspecies of *pygerythrus* and extended the range of the taxon to much of East Africa, apparently without discussing the holotype. East African *pygerythrus* seems quite isolated from those in South Africa both geographically than genetically (Haus *et al.* 2013). Therefore, the name *hilgerti* was adopted for the Eastern subspecies of *Chlorocebus pygerythrus* (de Yong & Butynski 2010; Isbell & Enstam Jaffe 2013, Zinner *et al.* 2013; Svardal *et al.* 2017).

Most authors consider the holotype belonging to the *aethiops* species (Hill 1966; Napier 1981) based on morphological characters such as the white long cheek whiskers and a white tail tip (Fig. 1). Yet the original description also cites a rusty-red spot at base of the tail and hands and feet blackish, features usually associated to *pygerythrus*.

To complicate further the issue, de Beaux (1923) while accepting *hilgerti* as the name of the vervet found along the Webi Shebeli River in Somalia, noted some differences between the Somali male specimen he had at hand and the description of the species by Neumann: general coloration between ecru-olive and old gold rather than reddish olive, and tip of the tail that is dorsally black. The observation of de Beaux is interesting as it could be explained by intergradations between *C. aethiops* from the Northern highlands of Ethiopia and *C. 'pygerythrus'* from the Southern riverine forests of the Webi Shebeli, an hypothesis also supported by remarks in Haus *et al.* (2013).

Finally, attempting a first taxonomic revision of the *aethiops* complex in North-East Africa, de Beaux (1923: 252) proposed recognition of two species based on the difference of the ventral color of the tail; white in the northern form and reddish-brown in the southern form. He named the northern species *C. griseoviridis* Desmarest, 1820 (= *aethiops*) with subspecies *ellenbecki* Neumann, 1902, *matschiei* Neumann, 1902, and *toldti* Wettstein, 1918. The southern species was *C. pygerythrus* which includes a large number of subspecies, including *hilgerti* from the Webi Shebeli and a different form from the Juba River that he named "affinis *rufoviridis*" according the authority of Neumann (1902).

HAUS *et al.* (2013) produced an extensive study of the phylogeographic pattern of *Chlorocebus*, based on mitochondrial sequences, with a relatively good sampling from Ethiopia. One interesting result was identification of clade 6 (sister to the clade 5 of *Chlorocebus djamdjamensis*) formed by individuals phenotipically classified both as *pygerythrus* and *aethiops* originating from the Eastern massif and the Juba River. Although more sampling should be needed from the Webi Shebeli lower course, it is almost certain that the name *hilgerti* pertains here.

Fig. 1 a, b - Details of the holotype of *Chlorocebus hilgerti* (Neumann, 1902) at Museum für Naturkunde Berlin (photos by Jan Robovský).

Clade 8 of HAUS *et al.* (2013) covers most of East Africa. As the sampling for this clade apparently includes a skin from Bukava, the holotype of *Cercopithecus centralis* Neumann, 1900, and being this the oldest available name for the East African '*pygerythrus*', it is suggested that this name should be applied to this taxon (= clade 8), while the name *hilgerti* should be assigned - and limited - to clade 6 of HAUS *et al.* (2013). To note that even if later researches led to include the Webi Shebeli population in clade 8, *centralis* has priority over *hilgerti*. The same applies to *arenarius* Heller, 1913, the name employed by LERNOULD (1988) for the north-eastern subspecies of *pygerythrus*. It is therefore proposed to adopt *centralis* to indicate the vervet monkeys of East Africa and restrict *hilgerti* to the vervet/grivet population found in South-Western Ethiopia and Southern Somalia.

Although the taxonomy of this group will remain an hot issue of primatology, even considering the high degree of genetic permeability among the different species (SVARDAD *et al.* 2017), it is important to assure the maximum attention to nomenclature of a group of high biomedical relevance (SVARDAD *et al.* 2017; LIU *et al.* 2018). Further, comparison of behavioral and genetic studies may be complicated by taxonomic and nomenclature errors or oversimplifications (GIPPOLITI 2018).

It is possible that further studies will raise the taxonomic rank of *centralis* to a specific one. Perhaps this will facilitate the study of vervet geographic variability in East Africa. From a biogeographic point of view it is interesting to note that the distinctiveness of *hilgerti* - i.e. clade 6 of HAUS *et al.* (2013) - seems to confirm an historical ecological gap between the riverine forests of Southern Somalia and more southwards forests (GIPPOLITI 2006).

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ABSTRACT

In recent decades the name *hilgerti* Neumann, 1902 has been utilized to indicate the East African representative of *Chlorocebus pygerythrus* (F. Cuvier, 1821). In the present note the taxonomic history of *Chlorocebus* in North-East Africa is briefly reviewed and integrated with a discussion of *hilgerti* holotype and the results of recent genetic studies. Available evidence suggests that the first available name for the widespread vervet of East Africa is *centralis* Neumann, 1900, while the name *hilgerti* is better restricted to the population of South-Eastern Ethiopia - Southern Somalia that seems the result of intergradations between '*aethiops*' and '*pygerythrus*'.

RIASSUNTO

Il nome del Cercopiteco verde dell'Africa orientale (genere *Chlorocebus* Gray, 1870) (Primates, Cercopithecidae).

Nelle ultime due decadi il nome *hilgerti* Neumann, 1902 è stato utilizzato per indicare la popolazione orientale di *Chlorocebus pygerythrus* (F. Cuvier, 1821). Nella presente nota la storia tassonomica del genere *Chlorocebus* in Africa nord-orientale è riassunta ed integrata con una discussione sull'olotipo di *Cercopithecus hilgerti* e sui risultati di recenti indagini genetiche. Le evidenze al momento suggeriscono che il nome più antico per designare il cercopiteco verde dell'Africa orientale è *centralis* Neumann, 1900, mentre il nome *hilgerti* deve essere ristretto alla popolazione dell'Etiopia sud-orientale e della Somalia meridionale e sembra il risultato di intergradazione tra cercopiteci verdi del gruppo '*aethiops*' e del gruppo '*pygerythrus*'.

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